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History of Computers

In order to understand today's computers, it is important to study how computers evolved through time by discussing some of the major achievements. This section deals with the history of computers and identifies the major technological achievements of the four computer generations.

Humans needed devices that could be used to perform calculations as early as the period when they kept animals and started to trade with other people. They realized the need to calculate and to record information. Many people agree that the history of calculation began with the *Abacus* around 5000 B.C. in Egypt and China. It has a wooden frame with balls or beads strung on parallel wires. It is used for calculations. Afterwards, other developments include the invention of the *slide rule* in the 1620's and the first *mechanical calculating machine* in 1642.

Probably the first computer was designed by Charles Babbage in 1822. He devised a machine called the *difference engine*. In 1834, Babbage proposed a more elaborate computing machine, called the *analytical engine*. It was completely mechanical and needed thousands of components. Babbage was unable to produce most of these parts due to the technological limitations of his time.

Generation of Computers

The evolution of computer started from 16th century and resulted in the form that we see today. The present day computer however has also undergone rapid change during the last fifty years. This period during which the evolution of computer took place can be divided into five distinct phases known as Generation of Computer.

First Generation (1945-1955)

Computers in this generation were characterized by the use of *vacuum tubes* as the main component. As a result, they were very big, filling up entire rooms with tens of thousands of vacuum tubes. However, they were slow, unreliable (with a high failure rate) and expensive. They required extensive air conditioning to dissipate the heat generated by the large number of vacuum tubes. Programming was done by wiring up plugboards to control the machine's basic functions using sequences of only 0 and 1.

The Second World War has also contributed in the development of computers. A machine called *Colossus* was built in 1943 by the British to speed up the breaking of the Lorenz cipher. The Lorenz cipher was used by the German Army High Command to communicate by radio in complete secrecy. It was based on teletype a technology for sending text messages over telephone lines at very high speeds.

Second Generation (1955-1965)

The *transistor* was introduced in the mid-1950s and replaced vacuum tubes. As a result, computers became smaller in size, faster, and more reliable. These machines could be controlled using *high level programming languages* such as *COBOL* (COMmon Business Oriented Language) and *FORTRAN* (FORmula TRANslator). These programming languages allow the use of Englishlike statements to write programs. *Magnetic tapes* were also introduced in this generation as storage devices.

Third Generation (1965-1975)

Integrated circuits (ICs) also called *chips* replaced transistors. In ICs, several transistors are held in a silicon chip, whose size and power requirement is very small. As a result, computers became faster, smaller, and more reliable than before. Magnetic disks took the place of magnetic tapes as storage devices.

- **Tip:** Magnetic tapes are also used today, but only as *backup* devices because of their cheap price and high storage capacity. *Backup* means to copy the data from the hard disk into a tape as a precaution. If the disk is damaged, we will not lose the data if a copy is available.
- ICs are classified into four groups based on the number of transistors contained in a single chip, called the level of *integration*: *Small-Scale Integration* – *SSI* (contains tens of transistors), *Medium-Scale Integration* – *MSI* (contains hundreds of transistors), *Large-Scale Integration* – *LSI* (contains tens of thousands of transistors), and *Very Large-Scale Integration* – *VLSI* (contains hundreds of thousands of transistors and more). The first three levels of integration were achieved in the third generation while VLSI is a feature of the fourth generation.

Fourth Generation (1976 - Present)

The development of VLSI technology helped to manufacture computers that are small in size, cheaper in price, more powerful, efficient, and reliable.

Microprocessors were developed as a result of VLSI technology.

A *microprocessor*, also called the *Central Processing Unit (CPU)*, is a tiny device which houses the major components of a computer such as the Arithmetic and Logic Unit (ALU), registers, and the control unit. *Personal computers (PCs)* were developed using microprocessors. Because of their low price and user-friendliness, PCs started to be used in homes, smaller offices and schools. Until the mid 1980s, the user could give commands to the computer by typing them using a keyboard,

called *command-driven* interface. Later on commands could be given to the computer by clicking on images displayed on the screen using a mouse, called *Graphical User Interface (GUI)*. This made computers user-friendly. The concept was first developed in 1973 by Xerox Corporation's Palo Alto Research Centre (PARC) with a prototype called *Alto* that uses GUI. In 1984, the Macintosh computer from Apple Computer brought the user-friendly interface to many PC users.

Fifth Generation

The computer of 1990s are said to be fifth generation computer. The speed is extremely high in fifth Generation computer. Apart from this it can perform parallel processing. The concept of artificial intelligence has been introduced to allow the computer to take its own decision. It is still in a developmental stage.

Computers can be general-purpose or special-purpose:

- ❖ A *general-purpose* computer can solve any problem that can be expressed as a program and executed within the capacity of the computer, the size of the program, and the speed of program execution. Note that all the discussion in this book is about general-purpose computers.
- ❖ A *special-purpose* computer is designed to do a specific task. An example is a computer that is capable of doing only word processing. Standalone specialpurpose computers were popular in the 1930s and early 1940s. Nowadays, they are mostly found embedded within other devices. Many domestic and industrial devices such as mobile telephones and video recorders contain special-purpose computers. Computers embedded inside other devices are commonly referred to as *microcontrollers* or *embedded* computers.

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